CLAIMS

What is claimed is:

1. A method for accurate signal detection in a wireless environment, the method comprises:

receiving a radio frequency (RF) signal;

converting the RF signal into a down converted baseband signal;

performing a normalized auto-correlation on the down converted baseband signal to produce a normalized auto-correlation signal;

performing a periodic pattern detection on the down converted baseband signal to produce a normalized detected periodic signal;

comparing the normalized auto-correlation value with at least one auto-correlation threshold;

comparing the normalized detected periodic signal with a set of thresholds; and

when at least one of the normalized auto-correlation value compares favorably with the at least one auto-correlation threshold and the normalized detected periodic signal compares favorably with the set of thresholds, indicating that the down converted baseband signal is valid.

2. The method of claim 1, wherein the performing the periodic pattern detection comprises:

match filtering the down converted baseband signal to produce matched filtered signal, wherein coefficients of the match filtering correspond to a desired waveform of the down converted baseband signal;

convolving the matched filtered signal with the matched filtered signal to produce a squared absolute value of the matched filtered signal;

convolving the down converted baseband signal with the down converted baseband signal to produce a squared absolute value of the baseband signal; and

comparing the squared absolute value of the matched filtered signal with the squared absolute value of the baseband signal to produce the normalized detected periodic signal.

3. The method of claim 2, wherein the comparing the squared absolute value of the matched filtered signal with the squared absolute value of the baseband signal comprises:

determining a moving average of the squared absolute value of the baseband signal over a first number of cycles to produce a reference moving average;

determining a moving average of the squared absolute value of the matched filtered signal over a second number of cycles to produce an instantaneous moving average, wherein the first number of cycles is greater than the second number of cycles;

performing a logarithmic function on the reference moving average to produce a reference moving average logarithmic;

performing the logarithmic function on the instantaneous moving average to produce an instantaneous moving average logarithmic; and

subtracting the reference moving average logarithmic from the instantaneous moving average logarithmic to produce the normalized detected periodic signal.

4. The method of claim 1, wherein the comparing the normalized detected periodic signal with the set of thresholds comprises:

determining whether a peak of the normalized detected periodic signal exceeds a first threshold of the set of thresholds;

determining whether the peak of the normalized detected periodic signal exceeds a valley of the normalized detected periodic signal plus a second threshold of the set of thresholds;

determining whether a subsequent peak of the normalized detected periodic signal is approximately equal to the peak of the normalized detected periodic signal; and

when the peak of the normalized detected periodic signal exceeds the first threshold of the set of thresholds, the peak of the normalized detected periodic signal exceeds the valley of the normalized detected periodic signal plus the second threshold of the set of thresholds, and the subsequent peak of the normalized detected periodic signal approximately equals the peak of the normalized detected periodic signal, determining that the normalized detected periodic signal compared favorably to the set of thresholds.

5. The method of claim 4, wherein the determining whether the peak of the normalized detected periodic signal exceeds the first threshold of the set of thresholds comprises:

delaying the normalized detected periodic signal by a known period of a valid baseband signal to identify an approximate peak of the normalized detected periodic signal; and

utilizing the approximate peak as the peak of the normalized detected periodic signal.

6. The method of claim 4, wherein the determining the peak of the normalized detected periodic signal exceeds the valley of the normalized detected periodic signal plus the second threshold comprises:

selecting one of a plurality of approximate peaks of the normalized detected periodic signal as the peak of the normalized detected periodic signal;

selecting one of a plurality of approximate valleys of the normalized detected periodic signal as the valley of the normalized detected periodic signal;

subtracting the valley of the normalized detected periodic signal from the peak of the normalized periodic signal to produce a difference; and

comparing the difference with the second threshold.

7. The method of claim 6 further comprises:

delaying the normalized detected periodic signal to produce a plurality of delayed signals;

selecting a first set of the plurality of delayed signals to provide the plurality of approximate peaks; and

selecting a second set of the plurality of delayed signals to provide the plurality of approximate valleys.

8. The method of claim 4, wherein the determining whether the subsequent peak of the normalized detected periodic signal is approximately equal to the peak of the normalized detected periodic signal comprises:

delaying the normalized detected periodic signal by a known period of a valid baseband signal to provide the peak;

subtracting the peak from the subsequent peak to produce a difference;

computing an absolute value of the difference; and

comparing the absolute value of the difference with the third threshold.

9. The method of claim 1 further comprises at least one of:

performing the auto-correlation and the periodic pattern detection on a short training sequence of the down converted baseband signal; and

performing the auto-correlation and the periodic pattern detection on a long training sequence of the down converted baseband signal.

10. A method for accurate signal detection in a wireless environment, the method comprises:

receiving a radio frequency (RF) signal;

converting the RF signal into a down converted baseband signal;

performing a periodic pattern detection on the down converted baseband signal to produce a normalized detected periodic signal;

comparing the normalized detected periodic signal with a set of thresholds; and

when the normalized detected periodic signal compares favorably with the set of thresholds, indicating that the down converted baseband signal is valid.

11. The method of claim 10 further comprises:

performing a normalized auto-correlation on the down converted baseband signal to produce a normalized auto-correlation signal; and

when the normalized auto-correlation value compares favorably with an auto-correlation threshold, indicating that the down converted baseband signal is valid.

12. The method of claim 10, wherein the performing the periodic pattern detection comprises:

match filtering the down converted baseband signal to produce matched filtered signal, wherein coefficients of the match filtering correspond to a desired waveform of the down converted baseband signal;

convolving the matched filtered signal with the matched filtered signal to produce a squared absolute value of the matched filtered signal;

convolving the down converted baseband signal with the down converted baseband signal to produce a squared absolute value of the baseband signal; and

comparing the squared absolute value of the matched filtered signal with the squared absolute value of the baseband signal to produce the normalized detected periodic signal.

13. The method of claim 12, wherein the comparing the squared absolute value of the matched filtered signal with the squared absolute value of the baseband signal comprises:

determining a moving average of the squared absolute value of the baseband signal over a first number of cycles to produce a reference moving average;

determining a moving average of the squared absolute value of the matched filtered signal over a second number of cycles to produce an instantaneous moving average, wherein the first number of cycles is greater than the second number of cycles;

performing a logarithmic function on the reference moving average to produce a reference moving average logarithmic;

performing the logarithmic function on the instantaneous moving average to produce an instantaneous moving average logarithmic; and

subtracting the reference moving average logarithmic from the instantaneous moving average logarithmic to produce the normalized detected periodic signal.

14. The method of claim 10, wherein the comparing the normalized detected periodic signal with the set of thresholds comprises:

determining whether a peak of the normalized detected periodic signal exceeds a first threshold of the set of thresholds;

determining whether the peak of the normalized detected periodic signal exceeds a valley of the normalized detected periodic signal plus a second threshold of the set of thresholds;

determining whether a subsequent peak of the normalized detected periodic signal is approximately equal to the peak of the normalized detected periodic signal; and

when the peak of the normalized detected periodic signal exceeds the first threshold of the set of thresholds, the peak of the normalized detected periodic signal exceeds the valley of the normalized detected periodic signal plus the second threshold of the set of thresholds, and the subsequent peak of the normalized detected periodic signal approximately equals the peak of the normalized detected periodic signal, determining that the normalized detected periodic signal compared favorably to the set of thresholds.

15. The method of claim 14, wherein the determining whether the peak of the normalized detected periodic signal exceeds the first threshold of the set of thresholds comprises:

delaying the normalized detected periodic signal by a known period of a valid baseband signal to identify an approximate peak of the normalized detected periodic signal; and

utilizing the approximate peak as the peak of the normalized detected periodic signal.

16. The method of claim 14, wherein the determining the peak of the normalized detected periodic signal exceeds the valley of the normalized detected periodic signal plus the second threshold comprises:

selecting one of a plurality of approximate peaks of the normalized detected periodic signal as the peak of the normalized detected periodic signal;

selecting one of a plurality of approximate valleys of the normalized detected periodic signal as the valley of the normalized detected periodic signal;

subtracting the valley of the normalized detected periodic signal from the peak of the normalized periodic signal to produce a difference; and

comparing the difference with the second threshold.

17. The method of claim 16 further comprises:

delaying the normalized detected periodic signal to produce a plurality of delayed signals;

selecting a first set of the plurality of delayed signals to provide the plurality of approximate peaks; and

selecting a second set of the plurality of delayed signals to provide the plurality of approximate valleys.

18. The method of claim 14, wherein the determining whether the subsequent peak of the normalized detected periodic signal is approximately equal to the peak of the normalized detected periodic signal comprises:

delaying the normalized detected periodic signal by a known period of a valid baseband signal to provide the peak;

subtracting the peak from the subsequent peak to produce a difference;

computing an absolute value of the difference; and

comparing the absolute value of the difference with the third threshold.

19. The method of claim 10 further comprises at least one of:

performing the auto-correlation and the periodic pattern detection on a short training sequence of the down converted baseband signal; and

performing the auto-correlation and the periodic pattern detection on a long training sequence of the down converted baseband signal.

20. A radio frequency integrated circuit (RFIC) comprises:

a transmitter section operably coupled to convert outbound baseband data into outbound radio frequency (RF) signals;

a receiver section operably coupled to convert inbound RF signals into inbound baseband signals and to convert the inbound baseband signals into inbound data, wherein the receiver section includes a signal detection module operably coupled to determine whether the inbound baseband signals are valid by:

performing a periodic pattern detection on the inbound baseband signals to produce a normalized detected periodic signal;

comparing the normalized detected periodic signal with a set of thresholds; and

when the normalized detected periodic signal compares favorable with the set of thresholds, indicating that the down converted baseband signals are valid.

21. The RFIC of claim 20, wherein the signal detection module further functions to:

perform a normalized auto-correlation on the inbound baseband signals to produce a normalized auto-correlation signal; and

when the normalized auto-correlation value compares favorably with an auto-correlation threshold, indicate that the inbound baseband signals are valid.

22. The RFIC of claim 20, wherein the signal detection module further functions to perform the periodic pattern detection by:

match filtering the down converted baseband signal to produce matched filtered signal, wherein coefficients of the match filtering correspond to a desired waveform of the down converted baseband signal;

convolving the matched filtered signal with the matched filtered signal to produce a squared absolute value of the matched filtered signal;

convolving the down converted baseband signal with the down converted baseband signal to produce a squared absolute value of the baseband signal; and

comparing the squared absolute value of the matched filtered signal with the squared absolute value of the baseband signal to produce the normalized detected periodic signal.

23. The RFIC of claim 22, wherein the signal detection module further functions to compare the squared absolute value of the matched filtered signal with the squared absolute value of the baseband signal by:

determining a moving average of the squared absolute value of the baseband signal over a first number of cycles to produce a reference moving average;

determining a moving average of the squared absolute value of the matched filtered signal over a second number of cycles to produce an instantaneous moving average, wherein the first number of cycles is greater than the second number of cycles;

performing a logarithmic function on the reference moving average to produce a reference moving average logarithmic;

performing the logarithmic function on the instantaneous moving average to produce an instantaneous moving average logarithmic; and

subtracting the reference moving average logarithmic from the instantaneous moving average logarithmic to produce the normalized detected periodic signal.

24. The RFIC of claim 20, wherein the signal detection module further functions to compare the normalized detected periodic signal with the set of thresholds by:

determining whether a peak of the normalized detected periodic signal exceeds a first threshold of the set of thresholds;

determining whether the peak of the normalized detected periodic signal exceeds a valley of the normalized detected periodic signal plus a second threshold of the set of thresholds;

determining whether a subsequent peak of the normalized detected periodic signal is approximately equal to the peak of the normalized detected periodic signal; and

when the peak of the normalized detected periodic signal exceeds the first threshold of the set of thresholds, the peak of the normalized detected periodic signal exceeds the valley of the normalized detected periodic signal plus the second threshold of the set of thresholds, and the subsequent peak of the normalized detected periodic signal approximately equals the peak of the normalized detected periodic signal, determining that the normalized detected periodic signal compared favorably to the set of thresholds.

25. The RFIC of claim 24, wherein the signal detection module further functions to determine whether the peak of the normalized detected periodic signal exceeds the first threshold of the set of thresholds by:

delaying the normalized detected periodic signal by a known period of a valid baseband signal to identify an approximate peak of the normalized detected periodic signal; and

utilizing the approximate peak as the peak of the normalized detected periodic signal.

26. The RFIC of claim 24, wherein the signal detection module further functions to determine the peak of the normalized detected periodic signal exceeds the valley of the normalized detected periodic signal plus the second threshold by:

selecting one of a plurality of approximate peaks of the normalized detected periodic signal as the peak of the normalized detected periodic signal;

selecting one of a plurality of approximate valleys of the normalized detected periodic signal as the valley of the normalized detected periodic signal;

subtracting the valley of the normalized detected periodic signal from the peak of the normalized periodic signal to produce a difference; and

comparing the difference with the second threshold.

27. The RFIC of claim 26, wherein the signal detection module further functions to:

delay the normalized detected periodic signal to produce a plurality of delayed signals;

select a first set of the plurality of delayed signals to provide the plurality of approximate peaks; and

select a second set of the plurality of delayed signals to provide the plurality of approximate valleys.

28. The RFIC of claim 24, wherein the signal detection module further functions to determine whether the subsequent peak of the normalized detected periodic signal is approximately equal to the peak of the normalized detected periodic signal by:

delaying the normalized detected periodic signal by a known period of a valid baseband signal to provide the peak;

subtracting the peak from the subsequent peak to produce a difference;

computing an absolute value of the difference; and

comparing the absolute value of the difference with the third threshold.

29. The RFIC of claim 20, wherein the inbound baseband signals comprises at least one of:

a short training sequence within a preamble of a frame of the inbound baseband signals; and

a long training sequence within a preamble of a frame of the inbound baseband signals.